COSC 123
Computer Creativity

Events

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Key Points

1) Explore the different types of events in the Alice world.

2) Handle events for the keyboard and mouse.

Event Processing

Most software has a graphical user interface (GUI) that contains buttons, text fields, lists, and menus.

An *event* is generated every time the user interacts with a user interface component by clicking a mouse or typing.

The code that responds to events is called *event handling*.

There is a default event: `When the world starts`. This event is executed immediately when the world is played.

Reference
Alice Events

World Events

◆ When the world starts
- ⇨ Occurs once when world first plays

◆ While the world is running
- ⇨ Executes continually while world runs

Mouse Events

◆ When the mouse is clicked on something
- ⇨ Occurs if button is pressed and released

◆ While the mouse is pressed on something
- ⇨ Occurs while mouse button held on object

◆ Let the mouse move the camera
- ⇨ Dragging the mouse moves the camera

◆ Let the mouse orient the camera
- ⇨ Dragging mouse moves camera direction

◆ Let the mouse move objects
- ⇨ Dragging mouse can move objects

Keyboard Events

◆ When a key is typed
- ⇨ Occurs when key is pressed and released

◆ While a key is pressed
- ⇨ Occurs while key is held

◆ Let the arrow keys move the object
- ⇨ Arrows keys move an object

Condition Events

◆ When a variable changes
- ⇨ Occurs when variable changes

◆ While something is true
- ⇨ Occurs while expression is true

◆ When something becomes true
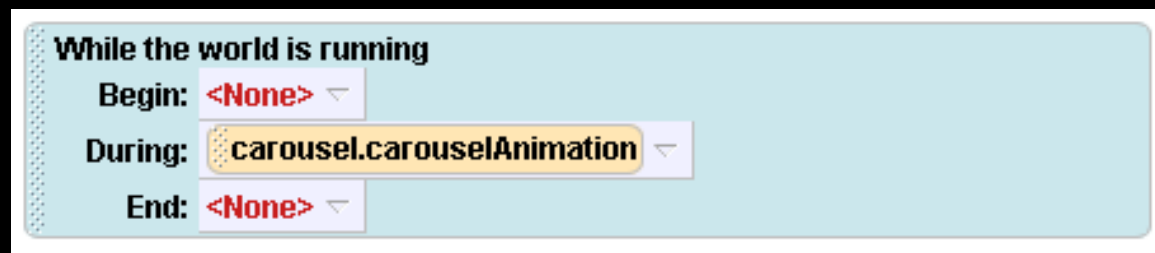- ⇨ Occurs once when true

World Events

World events occur when a world starts running or as it continues to run.

When the world starts event happens once at start of world and usually calls **my first method**.
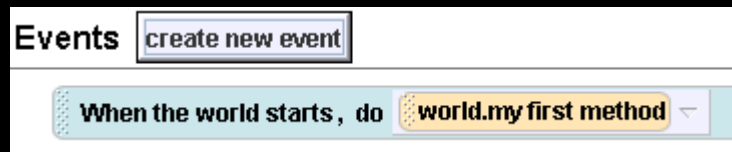
While the world running event has three parts:

◆ **Begin** and **End** are executed only once.

◆ **During** section is executed repeatedly.

World Events
Repeating Actions While World Runs

The statements in the **During** section repeat for as long as the world is running. Note that this is background animation, and you can have other code to do other things at the same time.

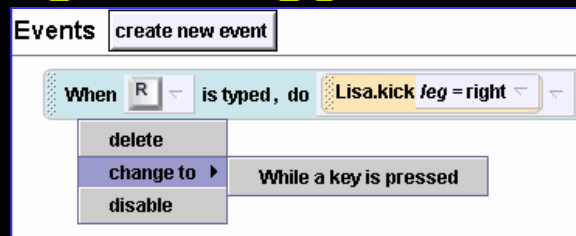# *Demonstration Exercise*
World Events

Use `carousel.a2w.`

Tasks:

◆ Make the carousel pause 1 second before starting to turn.

◆ Create three planes that fly past the carousel one at a time.

Keyboard Events

Keyboard events allow us to respond to keyboard presses.

The **When a key is typed** fires when a key is pressed *and released*.

Events | create new event

When [R] ▽ is typed , do | Lisa.kick *leg* = right ▽ | ▽

delete
change to ▶ | While a key is pressed
disable

While a key is pressed events are fired when the user presses *and holds* any of the standard keyboard keys (digits, letters, space bar or enter key).

Events | create new event

While | any key ▽ | is pressed
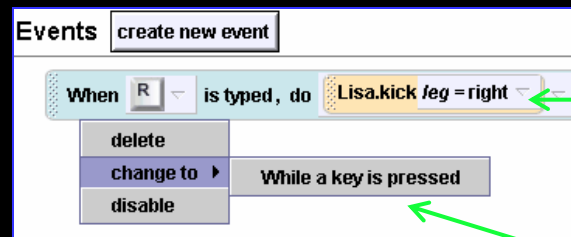Begin: <None> ▽
During: <None> ▽
End: <None> ▽
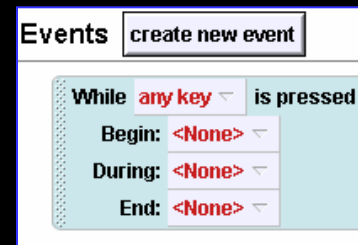
The **Let the arrow keys move an object** event allows the user to move an object forward, backward, and turn right and left using the arrow keys.

Events | create new event

Let | [↑] [←][↓][→] | move | camera ▽

Keyboard Events Examples
Dancer

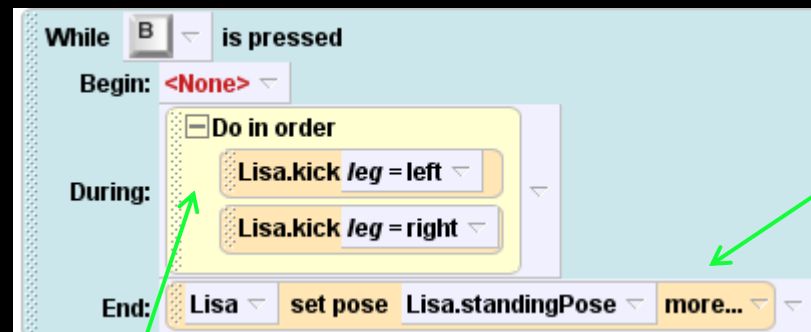We will make a dancer, Lisa, move when we press certain keys.

Lisa will call **kick** method (with right leg) when **R** is typed.

While a key is pressed is not in event menu, so must change a **When is typed** event.

Allows Lisa to be moved with arrow keys.

Capture a standing pose and **set pose** when user releases **B** so Lisa is not in an awkward position.

Lisa will call **kick** method with both legs in order while **B** is held.

Mouse Events

Mouse events allow the user to interact with the mouse.

1) The `When mouse is clicked on something event` executes code when a user clicks on an object.

2) The `While mouse is pressed on something event` executes code in during section multiple times while the mouse button is held on an object. Begin/end sections are done once.

`When mouse is clicked on something event`
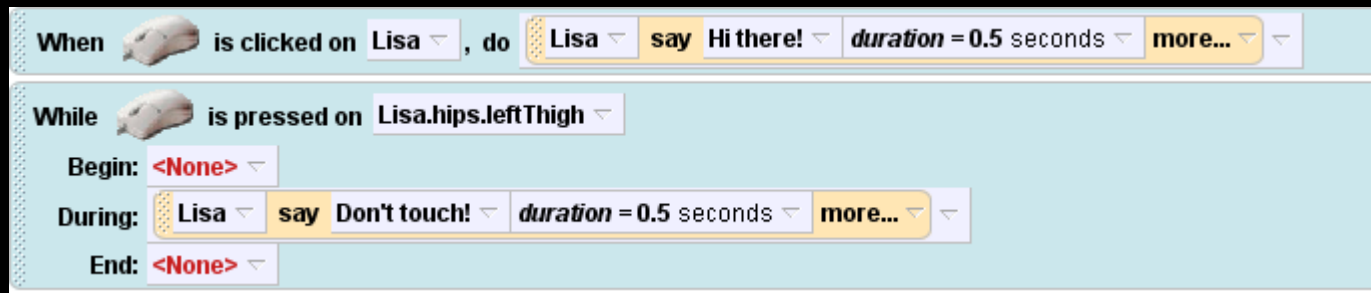
`While mouse is pressed on something event`

Mouse Events
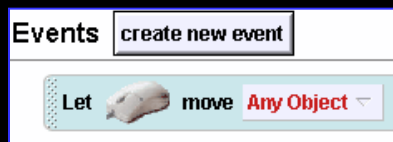# *Moving the Camera and World Objects*

3) Using **Let the mouse move the camera** event allows the user to move the camera forward, backward, right, and left.

4) The **Let the mouse orient the camera** event allows rotating the camera.

5) The **Let the mouse move an object** event allows the user to move any object or a list of objects that you specify.

Demonstration Exercise Keyboard and Mouse Events

Use `Rockette.a2w`.

Tasks:

- Make the dancer do left leg kicks and a head turn with the "`l`" key is typed.

- Make the dancer do a left knee raise when the "`h`" key is pressed and a right knee raise when the "`g`" key is pressed.

- Make it so that when the user holds "`b`" key the dancer repeatedly kicks her left leg and then her right leg.

- Allow the user to move the dancer around with the arrow keys.

- Make the dancer say "`Hi there!`" when you click on her.

- Make the dancer say "`Don't touch!`" when you press (and hold) the mouse button over her legs.

- Make the mouse able to move and orient the camera.

Condition Events

Condition events occur when the program state changes such as when the value of a variable changes.

Three types:

1) The `When a variable changes event` executes when the value of a variable that you provide changes.

2) The `While something is true event` occurs as long as a Boolean expression is true. (May be many times)

3) The `When something becomes true event` occurs once when a Boolean expression becomes true when it was previously false.

Events and Event Handling

Question: What happens when an event occurs and there is no event handler for it?

A) An event handler is created for it automatically.

B) The event is ignored and discarded.

C) An error occurs.

World Events

Question: True or false: A world always needs a `When the world starts` event.

A) true

B) false

World Events

Question: Which one of these statements is true?

A) The `When the world starts` event may be done multiple times.

B) The `begin` section of the `While the world is running` event is done every time the event occurs.

C) The `during` section of the `While the world is running` event may be performed multiple times.

D) The `end` section of the `While the world is running` event may be performed multiple times.

Keyboard Events
When a key is typed *event*

Question: The user is holding down the "**b**" key. How many times does the **When a key is typed** event occur?

A) 0

B) 1

C) 2

D) many times (depends how long the key is held for)

Keyboard Events
`While a key is pressed` *event*

Question: The user is holding down the " `b`" key. How many times does the `While a key is pressed` event occur?

A) 0

B) 1

C) 2

D) many times (depends how long the key is held for)

Mouse Events
`While mouse is pressed` *event*

Question: The user is holding down the mouse button on an object. How many times does the `While mouse is pressed` event occur?
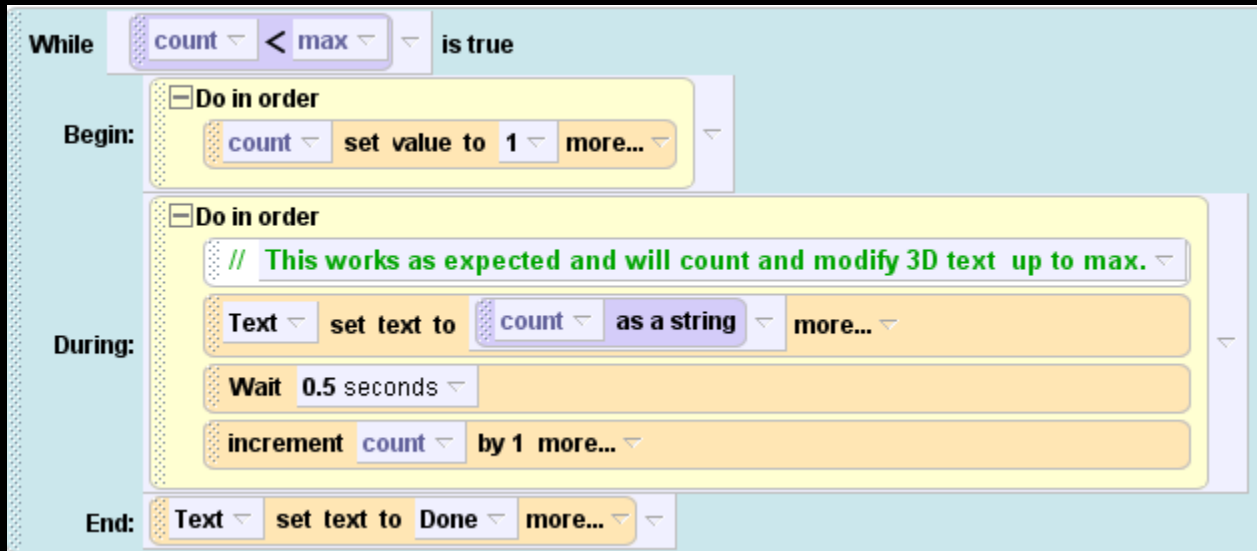
A) 0

B) 1

C) 2

D) many times (depends how long the mouse button is held for)

Condition Events
While something is true event

Question: How many times does the during part of the event execute if count is originally 0 and max is 10?

A) 0

B) 1

C) 9

D) 10

Exercises
Events

Exercise #1: Shooting Tank - Create a world with a tank.

◆ Move the tank around with the arrow keys.

◆ Use `while a key is pressed` for the `L` and `R` keys to rotate the turret left and right.

◆ Create a bullet (rectangle) and another object. When you press `space` shoot the bullet (forward 10 m). If it hits an object, have it say "Ouch!". Make sure you can shoot multiple times.

Exercise #2: Score a goal - Create a world with a net.

◆ The left/right arrow keys move a net around a circle.

◆ Have a ball randomly shoot out from the center of the circle in a random direction.

◆ The goal is to catch the ball in the net. Keep score.

⇨ Hint: Use a dummy object for the puck's starting spot. Make the puck invisible (opacity 0) then move it back to starting spot.

Conclusion

Events are generated under various circumstances such as user interaction with the keyboard and mouse.

Event handlers allow a program to respond to events.

Some events fire (execute) only once while other events fire repeatedly as long as the action is occurring.

◆ In Alice, events have `While` in name if execute multiple times and `When` if execute only once.

Event types in Alice:

◆ *World events* – apply to whole world (starting, running)

◆ *Keyboard events* – handle key presses

◆ *Mouse events* – handle mouse clicks ; can be used to move objects and camera

◆ *Condition events* – detect variable changes

Objectives

Key terms:

- event, event handling

Alice skills:

- Creating event handlers for four types of events: world, keyboard, mouse, condition.
- Grouping objects in object tree.
- Dummy objects for use with camera or object movement.